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Title: SWIFT - SHAPED-WAVEFORM INTERROGATION OF FLUIDS TECHNIQUE

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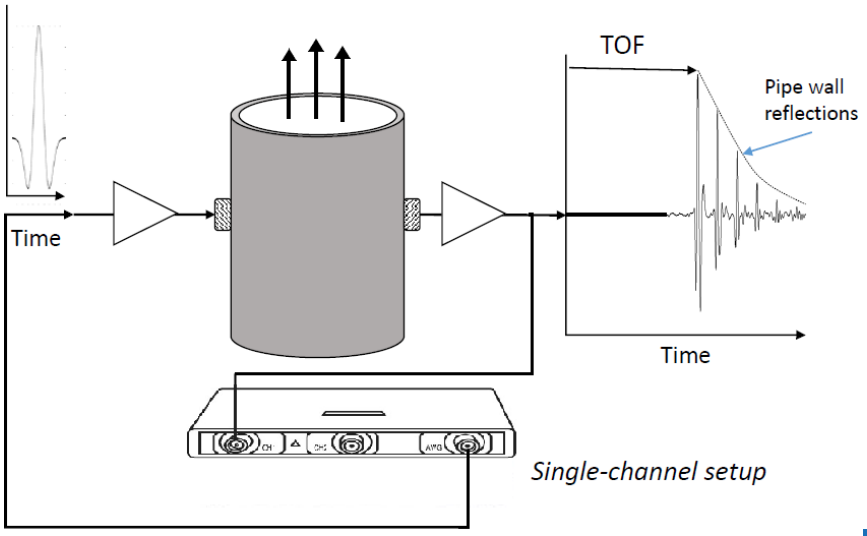

Los Alamos NATIONAL LABORATORY EST.1943

Tech Snapshot

Sensors

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SWIFT - SHAPED-WAVEFORM INTERROGATION OF FLUIDS TECHNIQUE

Fast and Inexpensive Ultrasonic Sensors for Process Monitoring Applications

SUMMARY

Researchers at Los Alamos have developed the Shaped-Waveform Interrogation of Fluids Technique (SWIFT), a technology enabling unprecedented process control capability. This technology provides important composition, flow rate, and pipe thickness measurements in real-time, at an extremely low cost and maintenance cycle. By utilizing a specialized shaped-waveform, as well as state-of-the-art signal processing, this information can be gathered without any frequency-domain signal processing, allowing for simplified electronics compared to nearly any other meter on the market. Since this technology is inexpensive and non-invasive, with the capability of measuring liquids in both flow pipes and sealed containers, it is perfect for several industrial applications in the oil and gas, beverage, chemical, and pharmaceutical spaces. We are seeking a commercialization partner to license the technology or fund us through a Cooperative Research and Development Agreement (CRADA) to a further develop a usable product for commercial purposes.

MARKET APPLICATION

This technology is already well-developed for the petroleum industry, with the capability of providing oil-field operators with crucial efficiency and quantified production data at the individual well level. Due to the non-invasive capability of the technology, however, it can provide process monitoring and quality control capabilities to any industry that requires flow rate and composition information without potential product contamination. Since this is an attractive proposition for many industries, it lends itself well to many different use cases in food and beverage, pharmaceutical, and chemical processing industries.

BENEFITS

This technology can provide a potential licensee or collaborator the ability to incorporate fast, non-invasive, and inexpensive flow rate and composition measurement capability into their devices. This process monitoring capability allows for an operator in nearly any industry to better control their processes without the use of invasive manual sampling or metering solutions, leading to lower operating costs through manual labor reduction and greater process efficiency.

- Accurate, real-time, continuous multiphase flow composition and flow rate measurements and monitoring of product through pipe or container.
- Completely noninvasive – may be incorporated into new device designs or retrofitted into existing ones without impacting flow of product.
- Cost effective – can be implemented into small footprint devices with commercially available parts providing for more points of monitoring of product.
- Reduces the need for invasive sampling methods such as manual sampling.
- Broadly applicable to any industry that requires multiphase flow and composition measurements.

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WHY WE ARE BUILDING SWIFT - SHAPED-WAVEFORM INTERROGATION OF FLUIDS TECHNIQUE

Originally designed to monitor oil and gas mixtures produced during oil production, the technology is extensible to many industries that have production challenges that cannot be resolved through invasive process monitoring technologies, due to sanitation or process requirements. As most current process monitoring technologies are invasive, several industries have process monitoring needs that are unmet. SWIFT technology addresses these issues without worries of product contamination, additional leak paths, expensive manual labor, or frequent maintenance cycles. This technology provides an improved method for many industries to address their process inefficiencies, and lower operating costs through reduced reliance on manual sampling as well as maximizing product yields.

WHAT'S BEHIND OUR TECHNOLOGY

Our SWIFT technology has been developed with a team combining well over 50 years of applied acoustics experience, and utilizes an elegant engineered acoustic waveform and signals processing approach. By using a very short engineered acoustic chirp-burst through the container or process pipe, several physical properties of the medium are extracted utilizing a time-domain signal processing approach. Derived quantities from this information include flow speed, density, pipe-wall thickness, and composition information. This technique works on nearly any fluid, lending itself to many different applications in industry.

OUR COMPETITIVE ADVANTAGES

Most current process monitoring meters are based on invasive measurement techniques, and can be expensive, have slow measurement speeds, have high maintenance requirements, or major fluid compatibility issues. SWIFT technology provides extremely fast measurement speeds, accurate results, requires little maintenance, and is inexpensive and low-profile enough to be placed exactly where it is needed. The technology can be retro-fitted to existing process piping, requiring zero installation downtime and no process modifications. SWIFT can replace the need for manual sampling at several production stages, and can provide clarity into production processes where other technologies cannot. This results in decreased operational costs and higher product quality due to less needed manual labor and reduced product loss due to contamination or process errors.

OUR TECHNOLOGY STATUS

Two-phase flow and composition measurements have been tested and proven in laboratory experiments, with some field tests for oilfield applications being completed. An additional ~1-3 years of development and testing would be required, depending on funding level, to raise this technology to a viable commercial product. For other industries, additional development time would depend on the exact application, but similar development time is expected. We are seeking a commercialization partner to license the technology or participate in a CRADA to a further develop a usable product for commercial purposes.

PUBLICATIONS AND IP

United States Application Number 17/035,483 “SHAPED WAVEFORM INTERROGATION OF MULTIPHASE FLUIDS.”